UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

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	Application No.	Applicant(s)
Office Action Summary	10/711,893	WAGNER ET AL.
	Examiner	**Art Unit**	
	Dangelino N. Gortayo	2168	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on _04 October 2007_.

2a) ☐ This action is **FINAL.**   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _1-63_ is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) _1-63_ is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a) ☐ All　b) ☐ Some * c) ☐ None of:

　　　1. ☐ Certified copies of the priority documents have been received.

　　　2. ☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
　　Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
　　Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set

forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this

application is eligible for continued examination under 37 CFR 1.114, and the fee set

forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action

has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on

10/4/2007 has been entered.

Response to Amendment

2.   In the amendment filed on 10/4/2007, claims 1 and 39 have been amended. The

currently pending claims considered below are Claims 1-63.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 1-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Arakawa et al. (US Patent 7,085,788 B2) in view of Armangau (US Patent 6,434,681

B1)

      As per claim 1, Arakawa teaches "A system for use in providing data storage

and data copies over a computer network, comprising:" (see Abstract)

      "a storage server system comprising one or more data storage servers that each

comprise a data storage device and a network interface," (Figure 1, Figure 13, Figure

21 references 100, 190, column 4 lines 1-13, column 13 lines 35-57, column 18 line 62

– column 19 line 24, wherein a storage device or a plurality of storage devices are

connected to a system host)

      "each of said data storage servers operable to communicate over said network

interface with at least one application client that will require data storage and at least

one other data storage server;" (Figure 1, Figure 13, Figure 21 references 600, 690,

column 4 lines 6-24, column 13 lines 37-45, column 18 line 62 – column 19 line 24,

wherein a storage device or a plurality of storage devices are connected to a mainframe

host computer containing management software for data storage)

      "and a data management system comprising at least one data management

server" (Figure 1 reference 100 and column 4 lines 1-10) "operable to (a) define at least

a first and a second cluster each comprising one or more data storage servers,"

(column 4 lines 23-42, column 11 lines 37-45, column 18 line 64 – column 19 line 7,

wherein one or more storage device can be assigned as storage device A, B, and C,

with each able to represent a plurality of storage devices)

"(b) define at least one primary volume of data storage distributed over at least two of said storage servers within one of said clusters, said primary volume storing data from the application client," (column 4 lines 43-53, column 13 lines 47-58, column 19 lines 8-24, wherein logical volumes are defined in storage device A that can represent data stored in a plurality of storage devices, acting as the primary data storage unit)

"(c) define at least one remote volume of data storage distributed over one or more of said storage servers within one of said clusters;" (column 4 lines 43-49, column 13 lines 47-58, and column 19 lines 11-37, wherein logical volumes in a different storage device separate from storage device A is defined)

"(d) create snapshots of said primary volume;" (column 10 lines 26-31, wherein a snapshot of the logical volume is made)

"and (e) copy data from said snapshots over the computer network to said remote volume." (column 10 lines 32-39, column 15 line 37 – column 16 line 28, wherein data written in the volumes of storage device A is also copied to volumes of storage device B)

Arakawa does not disclose creating snapshots of said primary volume with the creation of a first snapshot of said snapshots also causing the establishment of a new layer as the primary volume, said new layer containing a pointer to data in said first snapshot.

Armangau teaches creating snapshots of said primary volume with the creation of a first snapshot of said snapshots also causing the establishment of a new layer as the primary volume, said new layer containing a pointer to data in said first snapshot

(Figure 5, 6, column 13 lines 25-57, column 13 line 67 – column 14 line 45, column 14 line 62 – column 15 lines 17, wherein creating a snapshot means creating a list of pointers to the snapshots in a production volume mirrored by snapshot volume). It would have been obvious for one of ordinary skill in the art to combine Arakawa's method of providing data backup and copies over a network using snapshots of a volume with Armangau's method of creating a list of pointers and an index of pointers to snapshots when a snapshot copy of the production volume is first created. This would have given the user the advantage of being able to rapidly respond to backup requests by providing specified snapshot data to a user through the list and index of pointers. The motivation for doing so would be to ease the difficulty of frequent backups and rapid restoration of data to reduce data loss upon a storage system failure (column 1 lines 39-47)

As per claim 2, Arakawa teaches "each of said snapshots provides a view of the data stored at said primary volume at the point in time of said snapshot." (column 10 lines 22-26)

As per claim 3, Arakawa teaches "an application client is operable to read data stored in said snapshots at said primary volume." (column 15 lines 17-23)

As per claim 4, Arakawa teaches "an application client is operable to read data stored in said snapshots at said remote volume." (column 15 lines 17-23)

As per claim 5, Arakawa teaches "each snapshot includes data that has been modified at said primary volume since a previous snapshot of said primary volume." (column 16 lines 8-14, wherein snapshots are updated from the last snapshot taken)

As per claim 6, <u>Arakawa</u> teaches "said snapshots are copied to remote snapshots associated with said remote volume." (column 16 lines 20-27, wherein snapshot is sent to storage device B)

As per claim 7, <u>Arakawa</u> teaches "said snapshots are copied from said primary volume to said remote volume and at least a second remote volume distributed over one or more of said storage servers within one of said clusters." (column 19 lines 8-17)

As per claim 8, <u>Arakawa</u> teaches "said snapshots are copied from said primary volume to said remote volume and at least a second remote volume distributed over one or more of said storage servers within one of said clusters," (column 19 lines 8-17) "and wherein the source of said snapshots copied to said second remote volume is selected based on at least one of the volume most likely to be available, the least loaded volume, the volume with the highest bandwidth connection to the network, and the volume with a least costly connection to the network." (column 21 lines 13-23)

As per claim 9, <u>Arakawa</u> teaches "said snapshots are copied from said primary volume to said remote volume and are copied from said remote volume to a second remote volume distributed over one or more of said storage servers within one of said clusters." (column 19 lines 25-37)

As per claim 10, <u>Arakawa</u> teaches "said snapshots are created according to a predetermined schedule defined by said data management system." (column 10 lines 26-31)

As per claim 11, <u>Arakawa</u> teaches "said snapshots are copied to remote snapshots associated with said remote volume according to said predetermined schedule." (column 10 lines 32-39)

As per claim 12, <u>Arakawa</u> teaches "said data management system is further operable to designate said primary volume as a second remote volume that is not able to write data from application clients." (column 12 lines 7-24)

As per claim 13, <u>Arakawa</u> teaches "said data management system is further operable to designate said remote volume as a second primary volume, said second primary volume storing data from at least one application client independently of said primary volume." (column 12 lines 7-24)

As per claim 14, <u>Arakawa</u> teaches "said remote volume is designated as said second primary volume following a failure of said primary volume." (column 13 lines 10-15)

As per claim 15, <u>Arakawa</u> teaches "said remote volume is designated as said second primary volume following a determination by a user to create a second primary volume." (column 13 lines 25-34)

As per claim 16, <u>Arakawa</u> teaches "said data management system is further operable to designate said primary volume as a second remote volume that is not able to write data from application clients." (column 20 lines 15-24)

As per claim 17, <u>Arakawa</u> teaches "said data management system is operable to copy data from a snapshot of said second primary volume to said second remote volume." (column 20 lines 38-53)

As per claim 18, <u>Arakawa</u> teaches "said data management system is operable

to generate a snapshot of said primary volume prior to designating said primary volume

as said second remote volume." (column 20 lines 48-52)

As per claim 19, <u>Arakawa</u> teaches "said data management system is operable

to resynchronize said primary volume with said second primary volume." (column 20

lines 46-48)

As per claim 20, <u>Arakawa</u> teaches "said primary volume comprises a plurality of

logical blocks of data." (column 4 lines 50-59, wherein the logical volume of data is in

storage devices organized in blocks of data)

As per claim 21, <u>Arakawa</u> teaches "each of said plurality of logical blocks of data

comprises a plurality of physical blocks of data, each physical block of data comprising

a unique physical address associated with said data storage device and data to be

stored at said unique physical address." (column 4 lines 50-59)

As per claim 22, <u>Arakawa</u> teaches "said snapshots comprise pointers to logical

blocks of data stored at said cluster." (column 16 lines 11-16)

As per claim 23, <u>Arakawa</u> teaches "each of said logical blocks of data are

copied from said primary volume to said remote volume and at least a second remote

volume distributed over one or more of said storage servers within one of said clusters,"

(column 19 lines 8-17) "and wherein the source of each of said logical blocks of data

copied to said second remote volume is selected based on at least one of the volume

most likely to be available, the least loaded volume, the volume with the highest

bandwidth connection to the network, and the volume with a least costly connection to the network." (column 21 lines 13-23)

As per claim 24, Arakawa teaches "said network interface is adapted to connect to one of an Ethernet network, a fibre channel network, and an infiniband network." (column 4 lines 8-13)

As per claim 25, Arakawa teaches "said data management system is operable to copy data from said snapshots to said remote volume independently of network protocol." (column 4 lines 6-10, I/O paths)

As per claim 26, Arakawa teaches "said data management system is operable to copy data from said snapshots to said remote volume independently of network link bandwidth." (column 4 lines 6-10)

As per claim 27, Arakawa teaches "said data management system is operable to copy data from said snapshots to said remote volume independently of network latency." (column 4 lines 6-10)

As per claim 28, Arakawa teaches "said data management system is operable to copy data from said snapshots to said remote volume at a selected maximum bandwidth." (column 21 lines 27-30)

As per claim 29, Arakawa teaches "said selected maximum bandwidth is adaptively set based on the network bandwidth capacity and utilization of the network." (column 20 lines 3-8)

As per claim 30, Arakawa teaches "said selected maximum bandwidth is adjusted based on time of day." (column 20 lines 3-8)

As per claim 31, <u>Arakawa</u> teaches "said first primary volume is located at a first cluster and said first remote volume is located at a second cluster." (column 5 lines 17-22)

As per claim 32, <u>Arakawa</u> teaches "said first cluster and said second cluster are located at different geographic locations." (column 21 lines 31-37)

As per claim 33, <u>Arakawa</u> teaches "said data management server is a distributed data management server distributed over one or more data storage servers." (Figure 1, 12, 13, 21)

As per claim 34, <u>Arakawa</u> teaches "said data management server is further operable to redefine said primary volume to be distributed over one or more data storage servers that are different than said at least two data storage servers while copying data from said snapshots over the computer network to said remote volume." (Figure 1, 12, 13, 21)

As per claim 35, <u>Arakawa</u> teaches "said data management server is further operable to define at least one replica volume of data storage distributed over one or more of said data storage servers within one of said clusters, said replica volume storing data stored at said primary volume." (column 35-46)

As per claim 36, <u>Arakawa</u> teaches "said data management server is operable to create snapshots of said replica volume corresponding to said snapshots of said primary volume," (column 19 lines 8-17) "and wherein the source of said snapshots copied to said remote volume selected based on at least one of the volume most likely to be available, the least loaded volume, the volume with the highest bandwidth

connection to the network, and the volume with a least costly connection to the

network." (column 21 lines 13-23)

As per claim 37, <u>Arakawa</u> teaches "in the event of a failure associated with said

primary volume, said data management server is operable to copy said snapshots from

said replica volume to said remote volume." (column 13 lines 10-15)

As per claim 38, <u>Arakawa</u> teaches "said failure is at least one of a data storage

server failure and a network failure." (column 13 lines 10-15)

As per claim 39, <u>Arakawa</u> teaches "A method for copying data from a primary

data storage volume to a remote data storage volume in a distributed data storage

system, comprising:" (see Abstract)

"defining a first primary volume of data storage distributed over at least two data

storage servers within a first cluster of data storage servers," (column 4 lines 23-42,

column 11 lines 37-45, column 18 line 64 – column 19 line 7, wherein one or more

storage device can be assigned as storage device A, B, and C, with each able to

represent a plurality of storage devices)

"each of said data storage servers operable to communicate over said network

interface;" (Figure 1, Figure 13, Figure 21 references 100, 190, column 4 lines 1-13,

column 13 lines 35-57, column 18 line 62 – column 19 line 24, wherein a storage device

or a plurality of storage devices are connected to a system host)

"generating a first primary snapshot of said first primary volume, said first primary

snapshot providing a view of data stored at said first primary volume at the time said

first primary snapshot is generated;" (column 4 lines 43-53, column 13 lines 47-58,

column 19 lines 8-24, wherein logical volumes are defined in storage device A that can

represent data stored in a plurality of storage devices, acting as the primary data

storage unit)

"creating a first remote volume distributed over one or more data storage servers

within a cluster of data storage servers;" (column 4 lines 43-49, column 13 lines 47-58,

and column 19 lines 11-37, wherein logical volumes in a different storage device

separate from storage device A is defined)

"linking said first remote volume to said first primary volume;" (column 4 line 65 –

column 5 line 5)

"and copying data from said first primary snapshot to a first remote snapshot

associated with said first remote volume." (column 10 lines 32-39, column 15 line 37 –

column 16 line 28, wherein data written in the volumes of storage device A is also

copied to volumes of storage device B)

Arakawa does not disclose said first primary snapshot also causing the

establishment of a new layer as the primary volume, said new layer containing a pointer

to data in said first snapshot.

Armangau teaches said first primary snapshot also causing the establishment of

a new layer as the primary volume, said new layer containing a pointer to data in said

first snapshot. (Figure 5, 6, column 13 lines 25-57, column 13 line 67 – column 14 line

45, column 14 line 62 – column 15 lines 17, wherein creating a snapshot means

creating a list of pointers to the snapshots in a production volume mirrored by snapshot

volume). It would have been obvious for one of ordinary skill in the art to combine Arakawa's method of providing data backup and copies over a network using snapshots of a volume with Armangau's method of creating a list of pointers and an index of pointers to snapshots when a snapshot copy of the production volume is first created. This would have given the user the advantage of being able to rapidly respond to backup requests by providing specified snapshot data to a user through the list and index of pointers. The motivation for doing so would be to ease the difficulty of frequent backups and rapid restoration of data to reduce data loss upon a storage system failure (column 1 lines 39-47)

As per claim 40, Arakawa teaches "generating a second primary snapshot of said first primary volume, said second primary snapshot providing a view of data stored at said first primary volume at the time said second primary snapshot is generated;" (column 16 lines 34-45) "and copying data from said second primary snapshot to a second remote snapshot associated with said first remote volume." (column 16 lines 45-51)

As per claim 41, Arakawa teaches "said second primary snapshot includes data that has been modified at said first primary volume since said step of generating a first primary snapshot." (column 16 lines 8-14, wherein snapshots are updated from the last snapshot taken)

As per claim 42, Arakawa teaches "copying data from said first snapshot to a second remote volume distributed over one or more storage servers within a cluster of data storage servers." (column 19 lines 8-17)

As per claim 43, <u>Arakawa</u> teaches "copying said first remote snapshot from said first remote volume to a second remote volume distributed over one or more storage servers within a cluster of data storage servers." (column 20 lines 38-53)

As per claim 44, <u>Arakawa</u> teaches "said steps of generating first and second primary snapshots are performed according to a predetermined schedule defined by a data management system." (column 10 lines 26-31)

As per claim 45, <u>Arakawa</u> teaches "said steps of copying said first and second primary snapshots to said first and second remote snapshots are performed according to a predetermined schedule defined by a data management system." (column 10 lines 32-39)

As per claim 46, <u>Arakawa</u> teaches "designating said first remote volume as a second primary volume, said second primary volume storing data from at least one application client independently of said first primary volume." (column 12 lines 7-24)

As per claim 47, <u>Arakawa</u> teaches "said step of designating is performed following a failure of said first primary volume." (column 13 lines 10-15)

As per claim 48, <u>Arakawa</u> teaches "said step of designating is performed following a determination by a user to create a second primary volume." (column 13 lines 25-34)

As per claim 49, <u>Arakawa</u> teaches "designating said first primary volume as a second remote volume that is not able to write data from application clients." (column 20 lines 15-24)

As per claim 50, Arakawa teaches "copying data written to said second primary volume to said second remote volume." (column 20 lines 38-53)

As per claim 51, Arakawa teaches "generating a snapshot of said first primary volume;" (column 19 lines 25-37) "and designating said first primary volume as said second remote volume." (column 19 lines 38-45)

As per claim 52, Arakawa teaches "resynchronizing said second primary volume with said second remote volume." (column 20 lines 46-48)

As per claim 53, Arakawa teaches "generating a second primary snapshot of said second primary volume providing a view of data stored at said second primary volume at the time said second primary snapshot is generated;" (column 16 lines 34-45) "generating a second remote snapshot of said second remote volume providing a view of data stored at said first primary volume at the time said third primary snapshot is generated;" (column 16 lines 34-45) "copying data that has been modified at said second primary volume to said second remote volume." (column 16 lines 45-54)

As per claim 54, Arakawa teaches "creating a volume at a cluster of data storage servers;" (column 4 lines 43-49) "designating said volume as a remote volume;" (column 4 lines 43-49) "linking said remote volume to said first primary volume;" (column 4 line 65 – column 5 line 5) "and setting a maximum bandwidth at which data may be copied to said remote volume." (column 21 lines 27-30)

As per claim 55, Arakawa teaches "said step of setting is based on network bandwidth capacity and network utilization." (column 20 lines 3-8)

As per claim 56, <u>Arakawa</u> teaches "scheduling a maximum bandwidth at which

data may be copied to said remote volume." (column 20 lines 3-8)

As per claim 57, <u>Arakawa</u> teaches "said step of scheduling is based on at least

one of time of day and day of the week." (column 20 lines 3-8)

As per claim 58, <u>Arakawa</u> teaches "said data management system is a

distributed data management server distributed over one or more of said data storage

servers." (Figure 1, 12, 13, 21)

As per claim 59, <u>Arakawa</u> teaches "said primary volume comprises a plurality of

logical blocks of data, and wherein said step of generating a first primary snapshot

comprises moving a pointer associated with each of said plurality of logical blocks of

data from said primary volume to said first primary snapshot." (column 4 lines 50-59)

As per claim 60, <u>Arakawa</u> teaches "copying a first portion of said first primary

snapshot to said first remote snapshot;" (column 16 lines 45-51) "recording that said first

portion has been copied;" (column 16 lines 53-59) "and copying a second portion of said

first primary snapshot to said first remote snapshot." (column 16 lines 45-51)

As per claim 61, <u>Arakawa</u> teaches "said step of copying a second portion is

interrupted, and said step of copying a second portion is re-started based on said step

of recording." (column 20 line 61 – column 21 line 5)

As per claim 62, <u>Arakawa</u> teaches "the amount of data included in said first

portion is based on an amount of data contained in said first primary snapshot." (column

16 lines 11-16)

As per claim 63, <u>Arakawa</u> teaches "the amount of data included in said first portion is determined based on an elapsed time period since starting said step of copying a first portion." (column 20 lines 3-8)

Response to Arguments

5.   Applicant's arguments with respect to claims 1-63 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Cherian et al. (US Publication 20060018505)

7.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dangelino N. Gortayo whose telephone number is (571)272-7204. The examiner can normally be reached on M-F 7:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim T. Vo can be reached on (571)272-3642. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Dangelino N. Gortayo   Tim Vo
Examiner   SPE

TIM VO
SUPERVISORY PATENT EXAMINER
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